

## PATENT COOPERATION TREATY

PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

REC'D 06 SEP 2005

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## (PCT Article 36 and Rule 70)

Applicant's or agent's file reference P738PC00	<b>FOR FURTHER ACTION</b> See Form PCT/IPEA/416	
International application No. PCT/EP2004/050355	International filing date ( <i>day/month/year</i> ) 24.03.2004	Priority date ( <i>day/month/year</i> ) 25.03.2003
International Patent Classification (IPC) or national classification and IPC A23K1/14, A23K1/18		
<p>Applicant DANMARKS JORDBURGSFORSKNING et al</p> <p>1. This report is the International preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 7 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of 8 sheets, as follows:</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</li> <li><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</li> </ul> <p>b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)), containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> <p>4. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Box No. I Basis of the opinion</li> <li><input type="checkbox"/> Box No. II Priority</li> <li><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li><input type="checkbox"/> Box No. IV Lack of unity of invention</li> <li><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li><input type="checkbox"/> Box No. VI Certain documents cited</li> <li><input type="checkbox"/> Box No. VII Certain defects in the international application</li> <li><input type="checkbox"/> Box No. VIII Certain observations on the international application</li> </ul>		
Date of submission of the demand 24.01.2005	Date of completion of this report 06.09.2005	
Name and mailing address of the International preliminary examining authority:   European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer  Rooney, K Telephone No. +31 70 340-3931	



**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/EP2004/050355

**Box No. I Basis of the report**

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
  - This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:
    - international search (under Rules 12.3 and 23.1(b))
    - publication of the international application (under Rule 12.4)
    - international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the elements\* of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

**Description, Pages**

1-102 as originally filed

**Claims, Numbers**

1-43, 45-51 received on 02.06.2005 with letter of 02.06.2005  
44 received on 06.06.2005 with letter of 06.06.2005

**Drawings, Sheets**

1-10 as originally filed

- a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3.  The amendments have resulted in the cancellation of:
  - the description, pages
  - the claims, Nos. 52-88
  - the drawings, sheets/figs
  - the sequence listing (*specify*):
  - any table(s) related to sequence listing (*specify*):
4.  This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
  - the description, pages
  - the claims, Nos.
  - the drawings, sheets/figs
  - the sequence listing (*specify*):
  - any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/EP2004/050355

**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes:	Claims	2,4-8,12-42,45-47
	No:	Claims	1,3, 9-11, 43, 44, 48-51
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-51
Industrial applicability (IA)	Yes:	Claims	1-51
	No:	Claims	

**2. Citations and explanations (Rule 70.7):**

**see separate sheet**

**INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

International application No.

PCT/EP2004/050355

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Reference is made to the following documents:**

D1: "Project applications for the research programme FOJO II (2000-2005) : Product quality of organic beef and pork in relation to grazing system and feeding with bio-active crops (PROSQUAL)" [Online] 2000, - 2000 XP002291897 Retrieved from the Internet: URL:<http://www.okoforsk.dk/projekt/ii12/an s.pdf> [retrieved on 2004-08-10]

D2: RIDEOUT T C ET AL: "Fecal excretion of major odor-causing and acidifying compounds in response to dietary supplementation of chicory inulin extract in pigs" JOURNAL OF DAIRY SCIENCE, AMERICAN DAIRY SCIENCE ASSOCIATION, CHAMPAIGN, ILLINOIS, US, vol. 85, no. Supplement 1, 2002, pages 14-15, XP002263875 ISSN: 0022-0302

D3: HOSKIN S O ET AL: "EFFECT OF WITHHOLDING ANTHELMINTIC TREATMENT ON AUTUMN GROWTH AND INTERNAL PARASITISM OF WEANER DEER GRAZING PERENNIAL RYEGRASS-BASED PASTURE OR CHICORY" PROCEEDINGS OF THE NEW ZEALAND SOCIETY OF ANIMAL PRODUCTION, WELLINGTON, NZ, vol. 63, 2003, pages 269-273, XP008025489 ISSN: 0370-2731

D4: CHOI S H ET AL: "EFFECTS OF CHICORY FEEDING ON THE GROWTH AND CARCASS QUALITY OF KOREAN NATIVE GOATS" HANGUK CHUKSAN HAKHOE CHI - KOREAN JOURNAL OF ANIMAL SCIENCE, KOREAN SOCIETY OF ANIMAL SCIENCE, SUWON, KO, vol. 40, no. 3, 1998, pages 255-260, XP008025504 ISSN: 0367-5807

D5: HOPKINS D L ET AL: "CARCASS AND MEAT QUALITY OF SECOND-CROSS CRYPTORCHID LAMBS GRAZED ON CHICORY (CICHORIUM INTYBUS) OR LUCERNE (MEDICAGO SATIVA)" AUSTRALIAN JOURNAL OF EXPERIMENTAL AGRICULTURE, CSIRO, COLLINGWOD, AU, vol. 35, no. 6, 1995, pages 693-697, XP008025511 ISSN: 0816-1089

D6: KNARREBORG A ET AL: "Effect of non-starch polysaccharides on production of indolic compounds in entire male pigs" ANIMAL SCIENCE, DURRANT, GB,

**INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

International application No.

PCT/EP2004/050355

vol. 74, no. 3, 2002, pages 445-453, XP008025386 ISSN: 1357-7298  
D7: WO 99/22604 A (MARS UK LTD ; FONE JANEL (GB)) 14 May 1999 (1999-05-14)

2. Regarding the term processed, it is still unclear what contrast can be drawn by prior art forms of chicory (or chicory roots) versus the range of processes of claim 1.

- "Fresh fruits and vegetables are living tissues, although they may no longer be attached to the plant....Fresh fruits and vegetables need low temperatures (32-55°F) and high relative humidities (80 to 95 percent) to lower respiration and to slow metabolic processes. By slowing these processes, water loss is reduced.." From: <http://www.oznet.ksu.edu/library/hort2/mf978.pdf>

An example of a processing step which causes (at least) drying is a harvesting step.

The present wording of the claim therefore makes it difficult to differentiate between the claimed products and any product as described in the prior art. In addition, the chicory roots appear in the description to be just as useful as dried chicory with respect to their beneficial effects.

3. Chicory is known to contain inulin and other sugars or 'secondary metabolites'. Indeed, inulin extracted from chicory is known to comprise other components, albeit occasionally considered to be contaminants. It is therefore clear for those skilled in the art that chicory/chicory product contains inulin (known as a source for decades) in addition to sugars and/or secondary metabolites. Applicant argues for novelty of the chemical content of chicory roots but the argument is based on the effect of those constituents. Furthermore, secondary metabolites is clearly no limiting feature since there is no precise definition of a secondary metabolite with respect to its chemical composition. Secondary metabolites are defined in terms of their origin, much in the same way as the term natural versus synthetic is used to differentiate between the same molecule produced by alternative routes.

4. Claims 44 and 51 relate to products which are defined in terms of a process of manufacture Such claims are only admissible if the products as such are, inter alia, new

**INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

International application No.  
PCT/EP2004/050355

and inventive. A product is not rendered new merely by the fact that it is produced by means of a new process (see PCT Search and Examination Guidelines, Ch. 5.26). In the case of product claims 44 and 51, it appears impossible to discern any difference between those products produced by the applicants process and those produced by similar processes described in the prior art. In this case the product appears to be any chicory product containing roots.

5. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1, 43, 44 and 49-51 is not new in the sense of Article 33(2) PCT.

The document D1 clearly teaches that animals may be fed with chicory products as described in the amended claim 1, in order to reduce problems such as drip loss and boar taint (see D1: page 16, paragraph 2). The chicory root product and method for production are implicitly disclosed in the document D1 and its use as a feed for pigs and in the production of pig feed. While the use thereof is not specified to begin at least one day prior to slaughter, it might be considered implicit since the feed requires that amount of time at least for metabolism. The document D1 therefore removes novelty from the subject-matter of claims 1,43,44 and 49-51.

The document D2 discloses the use of a chicory to manufacture a chicory inulin extract containing feed for pigs (over 30kg) which is used for its beneficial effects on malodours associated with skatole (see D2; abstract). The document D2 therefore removes novelty from the subject-matter of claim 1.

The document D4 discloses the use of dietary chicory (implicitly a harvested type, since it is mixed with other components) in animals for improving flavour of goat meat (see D4; abstract). The document D4 therefore removes novelty from the subject-matter of claim 1.

The document D7 discloses a product processed in a manner similar to the present invention which comprises chicory root and inulin, the product being suitable for use in the methods of the present invention (see D7: page 3-4).

6. Should novelty be restored to the subject-matter of any of the independent claims, the

**INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

International application No.

PCT/EP2004/050355

above mentioned documents D1-D7 should also be considered when addressing the question of inventive step.

8. Dependent claims 3, 9-11 and 48 are disclosed in their present form in D1 (see D1: page 16, paragraph 2) and are therefore not novel.

Dependent claims 2, 4-8, 12-42, and 45-47 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step, since these claims refer to feeding protocols, target animals and results to be achieved which would be clear choices for those skilled in the art (see documents D1-D5 and the corresponding passages cited in the search report).

**Claims**

1. Use of a processed chicory product for the production of an animal feed product for

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- a) reducing taint in said animal and/or
- b) reducing the skatole content in said animal and/or
- c) reducing the androstenone content in meat and/or fat and/or blood of said animal and/or
- d) improving the sensory characteristics of meat of said animal and/or
- e) reducing malodour in the environment around said animal and/or
- f) reducing the amount of infections of the gastrointestinal tract of said animal

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wherein said processed chicory product comprises inulin and

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- one or more low molecular sugars and/or
- one or more secondary metabolites, and

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wherein said processed chicory product is

- i. a silage product and/or
- ii. a fermented product and/or
- iii. a heated product and/or
- iv. a dried product and/or
- v. an extract, and

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wherein said feed product is fed to an animal at least one day prior to slaughtering said animal.

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2. The use according to claim 1, wherein the processed chicory product is fed to the animal for at least two days, for example 3 days, such as at least one week, for example at least 1.5 weeks, such as at least 2 weeks, preferably at least 3 weeks, such as at least 4 weeks, for example at least 5 weeks, such as at least 6 weeks, for example at least 7 weeks, such as at least 8 weeks, for example at least 9 weeks, such as at least 10 weeks, for example at least 15 weeks, such as at least 20 weeks.

3. The use according to claim 1-2, wherein the processed chicory product is fed to the animal substantially until slaughter.

4. The use according to any of the preceding claims, wherein the processed chicory product is fed to the animal daily.

5. The use according to any of the preceding claims, wherein the chicory root product is fed to the animal at least one time a day such as several times daily, such as 2 times, 3 times, 4 times, 5 times, or more than 5 times.

10 6. The use according to any of the preceding claims, wherein the processed chicory product comprises at least 2.5 % on a daily energy basis of the ration of the animal.

15 7. The use according to claim 6, wherein the chicory root product part of the ration of the animal is at least 5 % on a daily energy basis.

8. The use according to claim 6, wherein the chicory root part comprises at least 10 % of the ration, more preferably at least 15%, more preferably at least 20%, more preferably at least 25%, more preferably at least 30 %, for example at least 35%, such as at least 40%, for example at least 50%, such as at least 60%, for example at least 75%, such as at least 90%, for example substantially 100%.

20 25 9. The use according to any of the preceding claims, wherein the animal is a ruminant, such as cow, sheep, goat, buffalo.

10. The use according to any of the preceding claims 1 to 6, wherein the animal is a monogastric species, such as horse, pig, poultry, dog, and cat.

30 35 11. The use according to claim 10, wherein the monogastric species is a pig.

12. The use according to claim 11, wherein the pig is a male pig.

13. The use according to claim 12, wherein the pig is an entire male pig.

14. The use according to claim 11-13, wherein the animal is a pig having a weight from 25 to 300 kg, preferably as from 55 to 160 kg.

5        15. The use according to any of the preceding claims, wherein the species of Chicory is *Cichorium intybus L.*

10      16. The use according to any of the preceding claims, wherein the processed chicory product comprises chicory roots which contain at least 5% inulin, more preferably at least 10% inulin, more preferably at least 15 % inulin, more preferably at least 20 % inulin, such as at least 25% inulin, for example at least 30 % inulin.

15      17. The use according to any of the preceding claims, wherein the processed chicory product comprises chicory roots which contain at least 5% FOS, more preferably at least 10% FOS, more preferably at least 15 % FOS, more preferably at least 20 % FOS, such as at least 25% FOS, for example at least 30 % FOS.

20      18. The use according to any of the preceding claims, wherein the processed chicory root product is a disintegrated product, such as a powder, flakes, pulp, slices, flour, pellets.

25      19. The use according to any of the preceding claims, wherein the processed chicory product comprises an inulin fraction and a low molecular weight fraction comprising coumarins and/or sesquiterpenes.

30      20. The use according to any of the preceding claims, wherein the skatole content of blood is reduced by at least 25%, more preferably at least 40%, more preferably at least 50%, more preferably at least 75%, more preferably at least 80%, more preferably at least 90%, more preferably at least 95%, more preferably at least 98%, more preferably to substantially 0.

35      21. The use according to claim 21, wherein the skatole content of blood and/or backfat is reduced to below the human sensory threshold.

5            22. The use according to claim 1-19, wherein the skatole content of backfat is reduced by at least 25%, more preferably at least 40%, more preferably at least 50%, more preferably at least 75%, more preferably at least 80%, more preferably at least 90%, more preferably at least 95%, more preferably at least 98%, more preferably to substantially 0.

10           23. The use according to claim 1-19, wherein the androstenone content is reduced by at least 10%, more preferably at least 25%, more preferably at least 40%, more preferably at least 50%, more preferably at least 75%, more preferably at least 80%, more preferably at least 90%, more preferably at least 95%, more preferably at least 98%.

15           24. The use according to claim 23, wherein the androstenone content in meat and/or fat is reduced to below the human sensory threshold.

20           25. The use according to claim 1-19, wherein improving the sensory characteristics meat comprising improving the sensory characteristics odour, flavour, taste and/or aftertaste of meat from a human sensory perspective.

25           26. The use according to claim 25, wherein the improvement of sensory characteristics is a reduction of boar taint comprising reducing Piggy/Animaly-odour and/or Piggy/Animaly-flavour to an acceptable level from a human sensory perspective.

30           27. The use according to claim 25, wherein the improvement of sensory characteristics is a reduction of boar taint comprising increasing acceptable sensory characteristics selected from the group of Fresh cooked pork meat like-odour and flavour, Sweet meaty-odour, Sweet-taste, Umami-taste, Meat/Gamey-odour and flavour, Herby-flavour, Spicy-flavour and Heat/spicy aftertaste, Nutty-odour, Metallic-flavour, Meat/Gamey-flavour, Herby-flavour, Spicy-flavour, Lactic/fresh sour-flavour.

35           28. The use according to claim 25, wherein the improvement of sensory characteristics is a reduction of lipid-oxidation comprising increasing

acceptable sensory characteristics selected from the group of Cardboard-odour and flavour and Linseed oil-odour.

29. The use according to claim 25, wherein the improvement of sensory characteristics comprises reduction of sensory characteristics selected from the group of: Piggy/Animaly-odour and flavour, Manure/Stable-odour and flavour, Livestock/Barney-flavour, Cooked liver/Organy-flavour, Musty-odour, Urine-odour, Sweat-odour, Flat Bitter-aftertaste, White pepper-flavour,, Chemical/medicinal-aftertaste, Unacceptability.

30. The use according to claim 29, wherein the improvement of sensory characteristics comprises improving sensory characteristics such that Hardness-texture is decreased and Tenderness and Juiciness texture are increased and are involved in improving acceptability

31. The use according to claim 1-19, wherein reducing of malodour in the environment is caused by a relative reduction in skatole and/or p-cresole and/or indole in the gastrointestinal tract of said animal.

32. The use according to claim 31, wherein reducting of malouour in the environment is caused by a relative increase in the amount of 2-pentanon and/or ethylbutyrate and/or propylpropionate and/or propylbutyrate and/or butanoic acid 2-methyl-ethylester in the gastrointestinal tract of said animal.

33. The use according to claim 32, wherein the monogastric animal is a furred animal, such as mink, fox, mouse, cat, muskrat, rabbit, hare, wolf, dog.

34. The use according to claim 32, wherein the monogastric animal is an animal used for meat, such as pig, poultry, rabbit, hare, more preferably wherein the monogastric animal is a pig.

35. The use according to any of the preceding claims 31 to 34, wherein the malodour is stable malodour and the animal is kept in a stable.

36. The use according to claim 35, wherein the animal is kept in the stable for at least 8 hours a day.

5 37. The use according to any of the preceding claims 32 to 36, wherein the malodour is manure malodour and the manure originates from animals fed with the chicory root product.

10 38. The use according to claim 1-19, wherein the infections are infections with parasites.

15 39. The use according to claim 38, wherein the parasites are worms.

40. The use according to claim 38, wherein the reduction is a reduction of the number of eggs in the animal faeces.

15 41. The use according to claim 38, wherein the infections are microbiological infections selected from *Coli*, *Salmonella*, *Campylobacter* and *Yersinia*.

20 42. The use according to claim 41, wherein the infections are worms selected from *Ascaris suum*, *Oesophagostomum dentatum*, *Oesophagostomum quadrispinulatum*, *Oesophagostomum brevicaudum*, *Oesophagostomum granatensis*, *Oesophagostomum georgianum*, *Haemonchus contortus*, *Trichuris suis*, and *Strongyloides ransomi* and *Trichinella* spp.

25 43. A method for preparing a processed chicory food product comprising inulin and

- one or more low molecular sugars and/or
- one or more secondary metabolites,

said method comprising the steps of

- providing chicory roots,
- processing said chicory roots by
  - a) ensiling and/or
  - b) fermentation and/or
  - c) heating and/or
  - d) drying and/or

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- e) extracting
- obtaining the processed chicory product.

5        44. A processed chicory product comprising components from chicory roots, where said components comprises at least inulin, and

- one or more low molecular sugars and/or
- one or more secondary metabolites and  
wherein said processed chicory product is

10      i. a silage product and/or  
ii. a fermented product and/or  
iii. a heated product and/or  
iv. a dried product and/or  
v. an extract.

15      45. The processed chicory product according to claim 46, wherein said low molecular sugars are selected from the group of glucose, fructose, sucrose, maltose, maltotriose, maltotetraose, fructan (tri to octasaccharides).

20      46. The processed chicory product according to claim 44 to 45, wherein said secondary metabolites are selected from the group of terpenes, phytosterols, polyamines, coumarins and flavonoids.

25      47. The processed chicory product according to claim 44 to 46, wherein said secondary metabolites are selected from the group of Sesquiterpene lactones such as 8-Deoxylactucin, crepidiaside, lactucin, lactupicrin, crepidraside, 11- $\beta$ -13-dihydrolactucin, picriside, sonchuside A, sonchuside C, cichoriolide A, cichoriosides A, cichorioside B and cichorioside C; Phytosterols such as Sitosterol, stigmasterol, and campesterol; Coumarines such as Esculetin (=aesculetin), esculin (the glucon of esculetin), cichoriin-6'- $\beta$ -hydroxyphenyl acetate and cichoriin; Flavonoids such as Luteolin 7-glucuronide, quercetin 3-galactoside, quercetin 3-glucuronide, kaempferol 3-glucoside, kaempferol 3-glucuronide, isorhamnetin 3-glucuronide; Anthocyanins such as Cyanidin 3-O- $\beta$ -(6-O-malonyl)-D-glucopyranoside and four delphinidin derivatives; Caffeic acid derivatives such as Caffeic acid,

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chicoric acid, and chlorogenic acid; Polyamines (biogenic amines) such as Putrescine, spermidine, spermine.

48.

5 The processed chicory product according to claim 44 to 47, wherein said processed chicory product comprises a chicory product that is:

- a silage product and/or
- a fermented product and/or
- a heated product and/or
- a dried product and/or
- an extract.

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49. Use of a processed chicory product according to claim 44 to 48 as a feed product for "grown up" (> 7 weeks) pigs.

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50. Use of a processed chicory product according to claim 44 to 48 for preparing a feed product for "grown up" pigs.

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51. A feed product comprising a processed chicory product according to claim 44 to 48.